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# *Drosophila* (DIPTERA: DROSOPHILIDAE) OF MELBOURNE VICTORIA, AND SURROUNDING REGIONS

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ABSTRACT: The *Drosophila* fauna of suburban/orchard habitats in the Melbourne region (latitude 38°S) differs from neighbouring temperate rain forests. Fermented fruit baiting is successful in the former habitat yielding 5 cosmopolitan species. These 3 are common, and 3 endemic subgenus *Scaptodrosophila* species. The rain forest fauna can be collected only by sweeping; it consists of 10 endemic *Scaptodrosophila* species (of which only *D. fumida* occurs in suburban/orchard habitats) and *D.* (*Sophophora*) *dispar* but no cosmopolitan species. Hence the two faunas are almost entirely different, due to non-overlapping resources utilized. In rain forests at high altitudes where species diversities are low, *D.* (*Scaptodrosophila*) *inornata* dominates almost totally.

Comparisons with the Townsville urban fauna (latitude 20°S) reveal: (1) only the two subgenus *Sophophora* sibling cosmopolitan species *D. melanogaster* and *D. simulans* are in common with Melbourne, (2) species numbers in Townsville are much higher due mainly to a northern *Sophophora* radiation, and (3) there is some species overlap between the Townsville urban and north Queensland rain forest faunas due to the success of fermented fruit baiting in both habitats, in contrast with the discrete Melbourne region habitat differences.

## INTRODUCTION

The genus *Drosophila* has speciated widely within Australia and many endemic species occur in natural habitats such as rain forests and undisturbed sedge areas, especially species of the typically Australian subgenus *Scaptodrosophila* (Bock & Parsons 1975, Bock 1976). There are also eight cosmopolitan species defined as occurring in all six of the commonly recognised faunal realms, Nearctic, Neotropical, Palearctic, Ethiopian, Oriental and Australian. Urban collections normally give some of these cosmopolitans using fermented fruit baits; indeed most laboratory studies of *Drosophila* are based on such generalist species. However, *Drosophila* species exploit a much wider variety of microbial degradation products of plant materials (including fungi) than is implied by successful fermented fruit baiting (Carson 1971). Here, the results of fermented fruit baiting in suburban/orchard habitats of the Melbourne region are given, together with collections within 63 km of Melbourne from tree fern gullies where baiting is ineffective; in the latter habitats flies are collected only by sweeping, so resources utilized as assessed by trapping method are completely different for two habitat categories.

## COLLECTIONS

Melbourne suburban/orchard collections have been carried out for many years by fermented fruit baiting. (Apart from my own collections, in recent years collections have been carried out by R. M. Cook, J. McDonald, J. A. McKenzie and G. J. Prince and some collection data are in the Ph.D. theses of the latter two persons). Species compositions especially their relative numbers vary widely from day to day and from season to season (McKenzie & Parsons 1974). For qualitative comparisons with the tree fern gully collections, results of all Melbourne populations have been pooled. In Table 1, approximate abundances are indicated by +++ for species representing more than 10% of the total collection, by ++ for those with more than 1%, and by + for those with less than 1%.

Fern gully yields by sweeping are much lower. Actual numbers swept during the summer of 1975/76 are in Table 2, and provide comparative data among localities.

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In both cases yields are maximal in summer, which is reasonable, since for southern temperate species resource utilization effectively ceases below about 12°C (Parsons 1978); in fern gullies in particular therefore, flies are unobtainable for many months of the year.

## RESULTS AND DISCUSSION

Eight species have been found in the suburban/orchard regions of Melbourne (Table 1), 5 being cosmopolitan and 3 *Scaptodrosophila*. Three cosmopolitan species have not been found in Melbourne, although 2 of subgenus *Drosophila* (*funebris, repleta*) are known from various localities in eastern Australia, but the third of subgenus *Sophophora* (*ananassae*) is known only from north Queensland including Townsville (Table 3). Two species only are common to both cities, the cosmopolitan subgenus *Sophophora* sibling species *D. melanogaster* and *D. simulans*, which have been collected in all large cities in eastern and south-western Australia. These two species are sympatric in many regions, but microecological differences are known especially in the vicinity of wineries, due to the utilization of alcohol as a resource by the former but not the latter species (McKenzie & Parsons 1972). The three additional Melbourne cosmopolitans are *D. busckii* and *D. hydei* which are rare and *D. immigrans* which is common; the latter is the most desiccation sensitive of the three common Melbourne cosmopolitan species (Prince & Parsons 1977) so its absence from the more extreme Townsville conditions (Bock 1978) is not surprising.

Two of the Melbourne *Scaptodrosophila* species, *D. enigma* and *D. lativittata* belong to the *lativittata* complex within the *coracina* species group, all of which are characterized by being attracted to fruit baits (Bock & Parsons 1978a). They are in rain forests from southern New South Wales to southeastern Queensland; presumably they have spread to the Melbourne region with the introduction of orchards. The third species, *D. fumida*, one of two patterned wing *Scaptodrosophila* species known, is widespread in southern Australia, especially orchards (Bock 1976), and has been found in southern Queensland rain forests. In contrast with the *lativittata* complex species, it also occurs rarely in southern rain forests away from fermented fruit resources (Table 2).

In contrast with the 8 Melbourne species listed in Table 1, a total of 14 have been collected (Table 3) by fermented fruit baiting in the urban regions of Townsville (Bock 1978), where, given the harshness of the environment, intuitively only the cosmopolitans *D. melanogaster* and *D. simulans* might have been expected. However, meteorological data show Townsville to have a humid summer providing conditions more permissive for *Drosophila* survival when temperatures are high as compared with drier conditions (Prince & Parsons 1977). Irrespective of the environment, the lower Melbourne species diversity is in any case to be expected, given the more extreme latitude and that

TABLE 1

*Drosophila* SPECIES COLLECTED BY FERMENTED FRUIT BAITING IN SUBURBAN/ORCHARD AREAS OF THE MELBOURNE REGION.

| Subgenus | | |
|---|---|---|
| *Drosophila* | *immigrans* Sturtevant | +++ |
| | *hydei* Sturtevant | + |
| *Dorsilopha* | *busckii* Coquillett | + |
| *Sophophora* | *melanogaster* Meigen | +++ |
| | *simulans* Sturtevant | +++ |
| *Scaptodrosophila* | *enigma* Malloch | + |
| | *lativittata* Malloch | ++ |
| | *fumida* Mather | ++ |

TABLE 2

NUMBERS OF FLIES COLLECTED FROM TREE FERN SITES IN THE MELBOURNE REGION.

| Localities* | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Distance from Melbourne (km) | 41 | 43 | 50 | 63 | 59 |
| Altitude (m) | 320 | 460 | 290 | 590 | 1130 |
| Subgenus *Sophophora* | | | | | |
| *dispar* Mather | 2 | – | – | – | – |
| Subgenus *Scaptodrosophila* | | | | | |
| *inornata* Malloch | 232 | 61 | 39 | 119 | 31 |
| *collessi* Bock | 47 | – | 7 | 1 | – |
| *rhabdote* Bock | 6 | – | – | – | – |
| *obsoleta* Malloch | – | – | – | 1 | – |
| *barkeri* Bock | 5 | – | 3 | – | – |
| *louisae* Parsons and Bock | 32 | – | 11 | – | – |
| *notha* Bock | 1 | – | – | – | – |
| *ehrmanae* Parsons and Bock | – | – | 10 | – | – |
| *parsonsi* Grossfield | 1 | – | 1 | 5 | – |
| *fumida* Mather | 1 | – | – | – | – |
| Number of Species | 9 | 1 | 6 | 4 | 1 |

* 1. Kinglake National Park, Ninks Road; 2. Kinglake National Park, Jehosophat Gully; 3. Badger Creek, near Healesville; 4. Mt. Donna Buang, Cement Creek; 5. Mt. Donna Buang, Summit.

TABLE 3

SPECIES NUMBERS IN MELBOURNE (LATITUDE 38°S) AND TOWNSVILLE (LATITUDE 20°S) REGIONS BY SUBGENUS.

| | MELBOURNE – | | TOWNSVILLE – |
|---|---|---|---|
| | Suburban Orchard | Treefern Gully | Summarized from Bock (1978) |
| *Drosophila* | 2 | – | 2 |
| *Dorsilopha* | 1 | – | – |
| *Sophophora* | 2* | 1 | 9* |
| *Scaptodrosophila* | 3† | 10† | 3 |
| Total | 8 | 11 | 14 |

* Includes *D. melanogaster* and *D. simulans*.
† Includes *D. fumida*.

the genus *Drosophila* is of tropical origin (Throckmorton 1975). The main fall in species numbers going south is due to the disappearance of 7 of the 9 *Sophophora* species found in Townsville. This is consistent with the presence of a minor north Queensland radiation in this subgenus in rain forests with some species overlapping with Townsville itself. With the exception of isolated flies, the overlap does not, however, extend to cosmopolitan species (Bock 1978, Bock & Parsons 1978b).

In the Melbourne region there are no records of cosmopolitans in temperate rain forests, which is predictable given the absence of fleshy fruits and the ineffectiveness of fermented fruit baiting (Parsons & Bock 1977a). In Table 2 tree fern gully collections by sweeping near Melbourne are given. Of the 10 *Scaptodrosophila* species and one *Sophophoran*, *D. dispar*, only one, *D. fumida* occurs in urban/orchard habitats (see above), showing the two major Melbourne region habitats to have entirely different faunas. This is reasonable since the faunas differ in a major way in resources utilized: the larvae of the rain forest species mine leaves, stems etc. (Bock & Parsons 1978a), not fruits. Therefore the limited overlap between the urban and rain forest faunas in the Townsville region disappears in the Melbourne region because the resources in the south are completely different, and it would be of interest to look at intermediate regions.

The dominance of the *inornata* species group (*inornata, collessi, rhabdote* and *obsoleta* in Table 2) in the south has been already established (Parsons & Bock 1977a). In addition the data show that the dominance of *D. inornata* itself becomes almost total at relatively high altitudes (localities 2,4,5) as compared with relatively low altitudes (localities 1,3) where *barkeri* group species (*barkeri, louisae*) and *bruneipennis* group species (*notha, ehramanae*) occur. The forests at the latter altitudes are floristically more complex than the former, so that as habitats become more marginal by altitude, species diversities fall such that eventually the *inornata* group totally dominates, as also found for western Victorian isolates or latitudinal extremes as in Tasmania (Parsons & Bock 1977a,b). *D. parsonsi*, a rare species not belonging to any of these species groups, is however exceptional in extending from southern Tasmania to North Queensland (at high altitudes), occasionally including rather marginal habitats for *Drosophila* such as locality 4 at an intermediate altitude between 3 and 5 (see Parsons & Bock 1977a for latitudinal data).

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